

REPORT
ON
THE WESTERN SECTION
OF THE PROPOSED

Pacific and Hudson Bay
Railway Company



BY
G. A. KYLE
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Introduction



The movement towards the development of the Peace River District in the northern portion of British Columbia and Alberta is one that has assumed importance only within very recent years. The Senate report of 1907 may perhaps be credited with first arousing public interest, and the information which was thus rendered available was sufficient to indicate that the District had immense resources, which, however, were of little use to the outside world owing to the then almost entire lack of transportation facilities. It was to supply this obvious want that application was made to the Dominion Government for the Pacific and Hudson Bay Charter, and the route was chosen upon the advice of the Surveyor-General of British Columbia. The charter was granted on May 19th, 1911, and it then became a question of determining as closely as possible the best route from the Pacific to the Peace River country and the resources of the country that would be traversed.

This work was taken in hand in March, 1912, and four different survey outfits were despatched to examine different parts of the route which it is proposed to follow for the first 800 miles from the Pacific Coast.

During the month of July a further party, consisting of Mr. Cartwright, who is in charge of the Company's Survey and Engineering work; Mr. Kyle, the Company's consulting-locating Engineer; and Mr. Harris, left Bella Coola to look over the work that had been done, and confer with the various field parties upon the work that still remained to do.

Towards the end of October the field operations were completed, and the report which is here presented represents a condensed statement of all the valuable information which has been obtained by the season's work.

This report may be briefly summarised as follows:—1. The distance from the Coast to the center of the Peace River Country is approximately 200 miles by this route, or about 200 miles shorter than by any other yet surveyed.

2. The cost of the first 800-mile section will be approximately \$36,000 to construct and equip.

3. The construction of this 800 miles will result in the development of

4,639,000 acres of first-class land, 2,020,000 acres of second-class, and 11,230,000 acres of waste, the latter including much land that will eventually be classed first, second and mineral. This acreage embraces only such land as falls within a distance of 25 miles on each side of the road. Branch lines, inland steamboat and other railway connections may be counted upon to increase the subsidiary acreage by at least a quarter.

4. Under Western conditions it is usual to estimate probable revenue after the third year at about 60 cents per acre on first-class land and 25 cents on second-class. On this basis the earning power of the Railroad would be \$4,110.00 per mile from products of the soil alone. Other valuable sources of revenue, such as merchandise and agricultural implements inbound, timber, mining, coal, passenger traffic, mails, telegraph and express, will yield \$1,500 additional per mile in the fourth year, and of course will increase rapidly as the land is settled and the various new towns on the route are populated. The gross earnings then in the fourth year should be about \$5,610.00 per mile. The fixed charges, including operating expenses and interest on the Bonds, will amount to \$5,166.00, leaving a net profit of \$444.00 per mile, and it is usual to estimate that where the country traversed is good, as in our case, this net profit will be subject to annual increase of about 30 per cent.

In considering the advantages of any Western Railroad it is well to remember that the opening of the Panama Canal will, as far as passage rates are concerned, bring Pacific Coast ports almost on a parity with New York, Montreal and Halifax. The difference in cost to settlers, according to the best advices available, will not exceed \$10, and since the West is unquestionably the land of opportunity at present, the Western sections of all Canadian Railroads should derive great benefit from the opening of this Canal.

I shall conclude by introducing the gentlemen whose reports are here presented, and by stating that I think nothing has been left undone that could have added weight to, or made more certain, the facts that are here presented, and this report should therefore afford a sound basis for future operations.

Mr. Kew has had a large and varied experience as locating and construction engineer in the United States, Alaska and Canada, and is probably without an equal in this capacity in North America.

Mr. Cartwright is the chairman of the Vancouver branch of the Canadian Society of Civil Engineers, member of American Railway and Maintenance

of Way Association, Licensed B. C. Land Surveyor, and for five years was Divisional Engineer for the Canadian Pacific Railway.

Mr. Harris is a practical Railroad man of thirty years' experience in the construction and operation of new roads in the West, and the development of business. He has acted as Superintendent of the Chicago & Northwestern Railway, and afterwards as Superintendent of the Union Pacific Railway, for whom he supervised for several years the most difficult division of their whole system.

W. DENHAM VERSCHOYLE.

November 22nd, 1912.



Report by
Mr. G. A. Kyle



W. D. Verschoye, Esq.,
Pacific & Hudson Bay Ry. Co.
Vancouver, B. C.

Dear Sir,—

I have the honor to hand you a report on the proposed Pacific and Hudson Bay Railway in Canada, from Bella Coola, the proposed Pacific terminus, in the Province of British Columbia, to the Smoky River, the heart of the Peace River country in the Province of Alberta, a distance of 800 miles. Attached to this report there are the following exhibits, which will be referred to later:

EXHIBITS.

- (a) A small scale map showing the Pacific Coast line from Vancouver north to Prince Rupert.
- (b) Map showing Bella Coola and proposed harbor.
- (c) Copy of Government Navigation Chart, showing Fitzhugh Sound, Burke Inlet and North Bentinck Arm, which form the approach to the Bella Coola harbor from the main Pacific Ocean.
- (d) General map of the Provinces of British Columbia and Alberta, showing the route of the proposed railway.
- (e) Condensed profile of the line, showing elevation and grades.
- (f) Charts showing weather conditions in Canada, issued by the Railway Land Branch of the Department of the Interior.

SOURCE OF INFORMATION.

The information on which this report is based was obtained as follows:

The writer, in company with Mr. E. C. Harris, one of your Company, and Mr. C. E. Cartwright, Consulting Engineer, left Vancouver on the 18th of July, 1912, and travelled on the steamer Venture to Bella Coola, arriving July 21st. From Bella Coola we travelled by pack team over the proposed route nearly to Fort McLeod, and returned via Fort St. James and down the Stewart around Lower Nechaco River to Fort George by canoe; thence up Fraser River to Willow Creek, up the Salmon River a few miles and back to Fort George by canoe. Thence down the Fraser River to Soda Creek by steamer; thence by automobile to Ashcroft; thence via Canadian Pacific Railway to Vancouver,

arriving on the 29th of August, after having travelled about 1,450 miles. Mr. Cartwright left us on the 13th of August and returned to Vancouver from Fort Fraser.

In addition to the above, as stated in Mr. Cartwright's report, during the past season he has made a preliminary survey of 52 miles up the Bella Coola River from Bella Coola, and had a large reconnaissance party in the field gathering data from which to make up this report, and making a comprehensive map on a scale of 2 miles to an inch in order to determine the most practical route from Bella Coola to Fort McLeod, a distance of 396 miles.

Between Fort McLeod and Smoky River, the writer has had a reconnaissance party under Mr. Lars Langloe in the field all of last summer gathering data for this portion of the line and making detailed surveys from Fort George north to a distance of 35 miles, in connection with a possible branch to Fort George from the main line. We have also had access to an old Canadian Pacific survey from Cateho Lake at mile 130, covering the same territory as the proposed railway, to the mouth of the Stewart River, at mile 249, a distance of 164 miles; also from the Arctic Divide at mile 355 we have had access to an old Grand Trunk Pacific survey covering the same territory as the proposed railway to the point where it would leave the Pine River at mile 539, a distance of 184 miles, or a total of 348 of the 737 miles of the main line over which there has been made an instrumental survey; this in addition to the 35 miles of preliminary line north from Fort George, in connection with the Fort George branch.

The writer while Division Engineer of the Grand Trunk Pacific Railway in 1901 and 1902, made preliminary surveys from Edmonton in a northwesterly direction toward the Pine River Pass, covering part of the territory that the proposed line will traverse. With the above information the writer feels that he has sufficient data, together with his personal knowledge of the country, to enable him to make a comprehensive report covering the project.

GENERAL PROJECT.

The project as now outlined includes the terminus at Bella Coola; 737 miles of main line from Bella Coola, in the Province of British Columbia, to the Smoky River, in the Province of Alberta, which is about the center of the deservedly far famed Peace River country; and a branch from the main line at mile 320 on the Salmon River in a south-easterly direction to Fort George.

a distance of approximately 62 miles, making a total of 799 miles of railway to be built.

BELLA COOLA HARBOR.

By referring to exhibit (c) it will be seen that Bella Coola harbor is situated on the head of the North Bentinck Arm, and is approached from the sea, a distance of about 80 miles, by Fitzhugh Sound and Burke Channel. It is 350 miles north of Vancouver via the inside channel route usually travelled by ships going north, and 200 miles via the same route south of Prince Rupert (see exhibit (a).) For vessels taking the regular ocean route to Japan and China the distance is 350 miles less than from Vancouver, but 130 miles longer than from Prince Rupert, probably not enough to effect freight or passenger rates.

For vessels to Southern ports and England via the Panama Canal, the distance will be 170 miles longer than from Vancouver, and 150 miles shorter than from Prince Rupert, which would probably not affect freight or passenger rates from England or remote distances.

APPROACH TO HARBOR.

By referring to exhibit (c) it will be seen that vessels approaching the harbor from the open sea first enter Fitzhugh Sound, which is a part of the inside route for vessels from Vancouver north to Prince Rupert and Alaskan points, is about 5 miles in width, from 25 to 139 fathoms in depth, is well lighted and presents no difficulties to navigation. After passing through Fitzhugh Channel vessels enter Burke Channel and the North Bentinck Arm, both of which are about the same minimum depth as the above channel, from $11\frac{1}{2}$ to 2 miles in width, free from islands, shoals, or tide rips, and present no difficulties to navigation; and although there are at present no lights, the coast steamers navigate them on the darkest nights. When Bella Coola is made an important port the Marine Department of the Canadian Government will undoubtedly establish sufficient light to safely navigate these channels. Therefore the approach to Bella Coola from the sea seems to be remarkably free from dangers to navigation, in fact the captain of the S.S. Venture stated that he always figured on a good rest after entering these channels. The harbor is free from ice the whole year, perfectly land-locked, being surrounded by mountains from 3,000 to 5,000 feet high, the longest reach of water does not exceed five miles. The average depth is 53 fathoms, which is too deep for good

anchorage. Moorings, however, can be established in the deep water if necessary, while along the south shore there is comparatively shoal water where vessels can safely anchor.

The harbor is $1\frac{1}{2}$ miles wide, extending clear across the east end of North Bentinck Arm, and is entirely composed of mud flats, which form an excellent site for the economical development of docks and wharves.

The land on the north side of the harbor is very precipitous and rocky, the water is very deep and does not lend itself to the location of wharves for a distance of two miles or more. But on the south side of the harbor the land is more favorable for wharves and tracks, and the water is of a moderate depth.

Referring to exhibit (b) it will be seen that there can be developed at least $7\frac{1}{2}$ miles of wharfage at the east end of the Arm, and two miles more can be developed along the south side of the harbor if required.

It is nearly an ideal location for the economic construction, operation and maintenance of docks and wharves, as there is an abundance of timber, piles, rock and brush in the immediate vicinity to make the cost of construction very cheap, and the maintenance of timber wharves will be reduced materially from the fact that sufficient fresh water is delivered into the harbor by the Bella Coola and Necleetsconnay Rivers to prevent the action of the toredo on the piling and timber below water. The material in the mud flats can be dredged with hydraulic dredges and placed behind bulkheads to form sites for warehouses and other buildings, tanks, etc., for about 8c or 9c per cubic yard.

RAILWAY TERMINALS.

Referring to exhibit (b) it will be seen that a comprehensive railway terminal can be developed; the land is level and mostly above high tide and can be cheaply graded. There is an Indian Reservation containing about 3,000 acres, which should be secured from the Government in order to be able to develop these terminals.

CLIMATE AND LOCATION.

The climate of Bella Coola is very mild and the rainfall is less than at either Vancouver or Prince Rupert. There is sufficient available land to build a large city, and altogether it is an ideal location.

GENERAL LOCATION OF THE ROUTE OF THE PROPOSED RAILWAY.

Referring to exhibit (d) it will be seen that from Bella Coola the line will

extend up the Bella Coola Valley to mile 61, and then loop up the Hathnarco River to the plateau between the Hathnarco and Salmon Rivers to mile 94; thence along the Salmon Valley to Cateho Lake at mile 133; thence down the Entiaco, Upper and Lower Nechacco River Valleys to mile 294, crossing the Lower Nechacco River and Grand Trunk Pacific Railway at this point; thence up the St. James River Valley 20 miles; thence in a generally northerly direction up either the Swamp or the Salmon Rivers to the Arctic Divide to mile 335; thence down Long Lake River Valley to a point 6 miles north of Fort McLeod at mile 396 on the Crooked River; thence up the Parsnip and south side of the Misinchinka River Valley to Pine River Pass at mile 434; thence down the south side of Pine River Valley to mile 451, where it will probably cross same; thence down the north side of Pine River Valley to where it will cross same at mile 539; thence eastwardly up Favel Creek to mile 558 at the Summit; thence down Prairie Creek; thence up Cut Bank Creek to the divide between Cut Bank and Pouce Coupe River at mile 594; thence eastwardly either down Dawson or Saskatoon Creek to the crossing of Pouce Coupe River at mile 618; thence eastwardly across Horse Plains, Bear Creek, Spirit River Prairie, to Spirit River, mile 664; thence in an easterly direction to Burnt River at mile 697; thence eastwardly one-half mile south of Egg Lake to the Smoky River at mile 737 from Bella Coola, and just north of the mouth of Bad Heart.

ALIGNMENT.

Referring to Mr. Cartwright's report, the alignment will be comparatively light between Bella Coola and Fort McLeod, excepting in ascending from the Bella Coola Valley to the plateau, where 10 degree maximum curves will be used, while a 6-degree maximum will cover all other parts of this portion of the line, from 2 to 4-degree curves will predominate.

From Fort McLeod to Smoky River the curvature will be generally from 2 to 4 degrees, and a maximum 6 degrees, excepting where passing through the Rocky Mountains, near Pine Pass, where 10 degree maximum curves will have to be used on heavy work.

GRADES EAST BOUND.

Referring to exhibit (e) it will be seen that the first 100-mile division will have a 1% maximum grade against traffic going east by using a pusher engine on 12 miles of a 2.2% grade. On the whole of the balance of the line there will

be a maximum 5-10% grade by using a pusher engine on the 1% grade between miles 425 and 432, a distance of 7 miles, ascending the Rocky Mountains at Pine Pass.

GRADES WEST BOUND.

The maximum grades west bound for the whole line will be 5-10% by using a pusher engine on the 1% grade between miles 434 and 446, a distance of 12 miles.

COMPARISON OF DISTANCES.

Referring to Mr. Cartwright's report, pages 36 and 37:

Distance via Pacific and Hudson Bay Railway—

Dunvegan to Bella Coola.....	700 miles
Dunvegan to Vancouver via Bella Coola	1050 "
Dunvegan to Vancouver via Pacific Great Eastern Ry...	887 "

Distance via Grand Trunk Pacific Railway—

Dunvegan to Prince Rupert via branch to Yellow Head Pass, thence via main line.....	1001 miles
Dunvegan to Prince Rupert via branch to Edmonton, thence via main line.....	1313 "
Dunvegan to Vancouver via branch to Yellow Head Pass thence main line to Fort George, thence via Pacific Great Eastern Railway.....	1002 "

Distance via Canadian Pacific Railway—

Dunvegan to Vancouver via branch to Edmonton and main line	1130 miles
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Distance via Canadian Pacific Railway—

Branch to Edmonton, thence via Calgary, thence main line	1138 miles
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The above statement shows that the P. & H. B. Railway has the shortest line to tide water at Bella Coola from the Peace River country by 300 to 400

miles over its possible rivals, and to Vancouver via connection with the Pacific Great Eastern Railway by 125 to 250 miles.

COMPARISON FROM FORT GEORGE TO TIDE WATER.

P. and H. B. Railway—

Fort George to Bella Coola via branch	382 miles
Fort George to Vancouver via Bella Coola	730 "

Grand Trunk Pacific Railway—

Fort George to Prince Rupert	465 miles
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Pacific Great Eastern Railway—

Fort George to Vancouver	465 miles
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From the above it will be seen that from Fort George via the P. & H. B. Ry. it is 83 miles shorter to tidewater than by any of its rivals.

GENERAL DESCRIPTION OF THE COUNTRY THROUGH WHICH THE LINE WILL RUN.

Mr. Cartwright has described the traffic possibilities of the country between Bella Coola and Fort McLeod and I shall only touch on the main points of interest.

BELLA COOLA VALLEY.

The Bella Coola Valley up to mile 61. where the line leaves it, is from $\frac{1}{4}$ to $4\frac{1}{2}$ miles wide with several small side valleys.

There is a heavy growth of timber below mile 40 that extends up the mountain slopes to an elevation of 2,000 to 3,000 ft. Above mile 40 the timber gradually gets to be smaller, less in quantity and of a poorer quality; there are probably one billion feet of merchantable timber in the valley, 50% of which is Douglas fir, 25% cedar and 25% spruce. There is also a large amount of cotton wood and small spruce that will produce a large amount of pulp.

There are at least 50,000 acres of first class agricultural lands in the valley, the elevation of which varies from sea level to 1,650 feet where the line leaves it.

The farmers who live there grow the following crops, viz.:

All kinds of vegetables, small fruit, berries, hops, barley, wheat, alfalfa,

in fact, any kind of crops now raised farther south in Oregon and Washington can be grown successfully there.

From mile 61, where the line leaves the valley, to the summit at mile 94, the elevation varies from 1,650 to 4,000 ft. in the valleys, and from 3,000 to 6,000 in the mountains. There is very little farming land, and the land that is capable of being utilized is mostly pasture land, which will produce but a small revenue, being covered with a thick, small growth of jack pine of no commercial value excepting to build houses and fences. From mile 94 to 183 the elevation varies from 2,700 to 3,700 feet in the valleys to 3,000 to 5,000 in the mountains. It is a great plateau, very broken outside of the valleys and covered with a thick small growth of jack pine and poplar of no commercial value as lumber, but may be used as cordwood, pulp, and for building houses, fences, etc.

There is quite a bit of good land around the Salmon River Valley, the Eutsuk and Natalkuz Lakes. One of the features of this country is the number of small meadows scattered through the valleys. It is not necessary to carry any horse feed for pack or riding horses traveling through the country. Another feature that strikes one is that above elevation 2,800 or 2,900 the land is not agricultural and is only good for stock purposes.

FROM MILE 183 TO MILE 294.

The elevation varies from 2,100 to 2,700 feet in the valleys and from 2,800 to 3,500 feet in the foot hills. The country from mile 183 assumes a different aspect as to agricultural lands, as all the valleys and lower plateaus are good agricultural lands, the higher lands are better adapted for pasture and there is not so much waste. The country is covered thickly with a small growth of jack pine, poplar, and balsam fir, poplar predominating in the valleys. There is some little merchantable timber, probably enough for local use.

FROM MILE 294 TO 396.

The country varies in elevation from 2,100 to 2,500 feet in the valleys and from 2,800 to 3,000 in the hills. There is comparatively little waste land in this section excepting along the Arctic Divide, and that will eventually be utilized as pasture land. The valleys are especially good land. This portion of the country is generally covered with a small thick growth of poplars, jack pine and balsam fir, poplar predominating in the valleys. There is some fir and

spruce timber in the mountains around Fort James and Fort McLeod, probably enough for local use, but not enough for any great amount of export.

At the old Hudson Bay posts in this territory at Fort St. James, Fort Fraser and Fort McLeod, which have been established for at least 100 years, they grow all kinds of vegetables, grains and grasses, which show that crops can be grown successfully in this climate and some hardy fruit can also be grown below elevation 2,500 to 2,600 feet. The land is especially good in the Upper and Lower Nechaco, Stewart, Salmon, Swamp, Crooked and Parsnip River Valleys. The branch to Fort George especially will run through a fine agricultural country.

FROM MILE 396 TO MILE 516.

At a point where the line runs around the mountain near the crossing of the Parsnip River at Mile 400 there will probably be a division point, and at some future time a branch line built to serve the Lower Parsnip, Upper Peace, and Finlay River country, as there is a large agricultural and stock country tributary to them. There is also, if all reports are true, a large mining country to be developed up the Finlay River.

On the Crooked River between the line and Summit Lake, which would be tributary to this line, there are 100,000 acres of fairly good spruce and fir, or, say one billion feet B. M. As this is the only large body of timber in this part of the country it is well worth remembering, about 50% is fir, and 50% spruce. There are also 50,000 acres of agricultural land and 600,000 of grazing land in the Crooked River Valley.

From the Parsnip River to the crossing of Pine River, the line lies mostly in the Rocky Mountains, for a distance of 127 miles and the only agricultural and pasture lands lie in the Crooked, Parsnip and Pine River valleys. The country is very rough and contains peaks running to an elevation of from 6,000 to 8,000 feet. The other valleys are narrow and generally have muskeg or gravel bottoms and rocky hillsides. The country is generally covered with a thick small growth of timber up to an elevation of about 5,000 feet.

There is considerable spruce and balsam timber that can be utilized in

making pulp. The Pine River lands can be utilized as pasture, for the growth of hardy vegetables and for stock raising.

FROM MILE 523 TO MILE 737.

This part of the line runs through what is popularly called, the Peace River country, and has been almost continuously the theme of special reports, newspaper and magazine articles for the last fifteen or twenty-five years, and is the most extensive wheat and general farming area now unsettled on the continent. Quoting from Mr. Langloe's report, the portion that the line traverses lies south of the Peace River, and is an elevated plateau broken by a few isolated hills and ridges, and the valleys of the streams running north into the Peace River. The general elevation varies from 1,800 to 2,500 feet, with a few isolated points 2,800 feet high, and general slope from the south toward the Peace River. At mile 548 the line crosses the line between the Provinces of British Columbia and Alberta.

The line runs generally about 25 miles south of Peace River, excepting near Dunvegan, where it is only about 15 miles distant.

The country is generally covered with a small thick growth of poplar, willow and birch, and in some places some spruce, but the deciduous trees predominate. However, within this district are several extensive prairies, the most important of which are Pouce Coupe and Spirit River Prairies. The former has at least 200,000, and the latter 150,000 acres. There are also a large number of smaller prairies from 10,000 to 20,000 acres in extent. The lands in this district are absolutely first class. The soil is a dark loam, mixed with dark, rich clay, with clay subsoil, and the luxuriant growth of vegetation bears ample testimony as to the excellent character and productiveness of the soil. Wild grasses, such as peavine, red top, wild parsnips, etc., grow everywhere to a height of two or three feet, which hinders a person when walking through it.

The Hudson Bay factor, at St. Johns, informed Mr. Langloe that the Company had been raising vegetables, grains and potatoes for home use for the last hundred years. Mr. Bedson, the factor at Dunvegan, told him the same thing. At Spirit River, a halfbreed settlement, some of whom are very intelligent, say they have been raising grains and vegetables for years, and they usually get good crops, although they are poor farmers. Dr. Arthur Trembly,

an old timer in the country, has a ranch on Pouce Coupe Prairie, south of Dawson's Creek. He has a large piece of ground under cultivation and raises some grain, potatoes and all ordinary vegetables. He says that frost very seldom did any damage to the crops and that they were uniformly excellent. In conclusion I believe that the Peace River country will eventually become a mixed farming country. To begin with, for several years, no doubt, wheat and other grains will be the main crop on the prairies, where the land is most easily cleared. Potatoes, other vegetables and hay should grow exceedingly well and will become important industries. Stock raising should become a paying business for the farmer.

The country on the north side of the Peace River is equally as good as that on the south side, and is also fully equal in extent and will soon call for a branch line to serve it. With railway transportation the millions of agricultural lands in the Peace River district will develop even more rapidly than the famous Manitoba wheat country, as lands are becoming more scarce every year and the impetus of successful farming in other parts, not so favorably situated, will settle up this country unusually fast.

SOIL AND CLIMATE ALONG THE LINE OF THE PROPOSED RAILWAY.

In the Bella Coola valley the soil is a sandy loam, very rich and deep, with gravelly clay subsoil. The climate is quite mild and the rainfall is very plentiful with no late frosts to kill the crops. There is from two to three feet of snowfall during the winter. From mile 61 to the top of the plateau the soil is not very deep, excepting in the valleys, which are quite narrow. The upland soil is shallow and only suitable for grasses. On the Chilcotin plateau there is quite a bit of good stock country.

The climate varies from mild in the lower valleys to very cold on the plateau, where late frosts will kill vegetation. Snow falls to a depth of three to six feet.

FROM MILE 91 TO MILE 183.

The soil is fairly good in the low grounds and valleys and will raise good grasses. In the Salmon River bottoms vegetation grows very profusely and the soil is sandy loam. On the north side of the summit in the river valley the soil is only good in the valleys and lowlands along the lakes. The

soil is a clay loam, quite deep in the valleys and grows thinner as the elevation increases. The climate is quite severe in the winter, but the summers are warm and the sun shines longer during each day than it does farther south. Snow falls to the depth of three to six feet in the winter. There is sufficient rainfall to grow crops. The average precipitation is about twenty inches.

FROM MILE 183 TO 296.

The soil is dark clay loam and is deeper and richer than farther south. It decreases in depth as the elevation increases above the valleys. The climate is cold in the winter, but warm and pleasant in the summer. There is plenty of rainfall to grow crops. The average precipitation is about fifteen to twenty inches.

FROM MILE 296 TO 396.

The soil is very rich and is a dark, alluvial, sandy, clay loam, quite deep. The climate is cold in winter for a short time, but the summers are warm and pleasant. Rainfall is sufficient to raise crops. The precipitation is about twenty inches per year.

FROM MILE 396 TO 523.

The soil, excepting in the Parsnip, Crooked and Pine River valleys, is very light, as this portion lies almost wholly in the Rocky Mountains. The winters are quite severe for a short time, but the summers are mild and pleasant. The rainfall is rather light, being from ten to fifteen inches per annum.

FROM MILE 523 TO 737.

In the Peace River country the soil is very deep and absolutely first class, it is a rich dark clay loam with clay subsoil. The climatic conditions are not severe considering the latitude, and are milder than in the Edmonton section. The winters are quite long and cold for a short time, but the sun shines longer than farther south and vegetation grows faster during the long, hot summer days. The rainfall is sufficient to raise all kinds of crops, according to the few inhabitants who reside in the country, and will average twenty to thirty inches annually.

The climate and rainfall in general, referring to exhibit (f), charts Nos. 2, 3 and 4, which show the Isothermal lines and number of days above freezing. These show the lines of same temperature, bending to the northwest after

Hudson Bay is passed. This apparent inconsistency is accounted for by the Japanese current that sweeps along the Pacific Coast southward in its circular return to the south, tempering the climate along the coast and the warm winds are swept back by the current of air that flows from the northwest. This 70 degrees latitude on the Pacific Coast has the same average temperature as 50 degrees on the Atlantic Coast.

Referring again to exhibit (f), chart No. 1, showing number of hours of sunshine. The territory through which the railway line runs shows from 16 to 17 hours of sunshine per day, while the south line shows only 15 to 16 hours per day, hence it will be seen that there is a compensation in the actual hours of heat during the growing season that offsets the shorter season that the sun shines in this latitude. Referring again to exhibit (f), chart No. 5, that shows line of equal rainfall. This shows 60 inches of annual precipitation at Bella Coola and plenty of rainfall, excepting a strip about 100 miles wide in the interior of British Columbia, but the people who live in this region say that only in isolated years does the drouth interfere with the raising of crops.

MINERALS AND MINES.

Mining along this line has not, of course, been developed to any extent, owing to lack of transportation, but prospectors who have prospected in a limited way, report coal, iron, gold, copper, etc.

I refer you to Mr. Cartwright's report, page 42, for this information between Bella Coola and Fort McLeod.

FROM FORT McLEOD TO THE SMOKY RIVER.

(Quoting Mr. Langloë.)

COAL DEPOSITS.

Coal deposits of great extent and value have been located and claims covering 75 square miles staked on both sides of the Peace River, a few miles above Hudson's Hope, and the coal is said to be semi-anthracite of good quality. Coal croppings are found in nearly every creek in this part of the country, and it is safe to say that coal mining will be an important industry on the east side of the Rocky Mountains and will furnish a large traffic to a railway. Coal has also been found on the Pine River above the Middle Fork and a number of claims have been staked out in the last year or two. The indications are good, but no development work has been done, and it is difficult to say what value to attach to the fields or to their extent.

GOLD AND OTHER MINERALS.

It has long been known that placer gold exists along the Parsnip River, and in early days several attempts were made to mine there, but the cost of transportation was so great that it was impossible to work at a profit.

The gravels and sands along the Peace River are gold bearing through almost its entire course, and with railway transportation extensive developments will surely take place. A great stretch of the river is now covered with hydraulic leases.

FINLAY RIVER.

The country drained by the Finlay and its tributaries are very rich in placer gold and other minerals. The Omineca River and its tributaries have also placer gold, which has been profitably mined since its discovery in 1868.

Gold was discovered in paying quantities on the Parsnip River in 1861, and in 1862 on Finlay Bar, which gave wonderful results for several years. This district is acknowledged to be among the most promising in British Columbia.

COPPER.

Copper, silver and other valuable minerals have been located in this district. An enormous body of gold-bearing quartz has been found and staked on the northwestern slopes of Mount Selwyn a few miles below Finlay Forks. Finlay Forks district will, no doubt, with railway transportation, become a district of considerable importance in the mining world.

FISHERIES.

The fisheries of British Columbia are capable of great development, the only fisheries fully developed being salmon canning. The greatest fishing grounds for halibut, cod and other fish are in the vicinity of Queen Charlotte's Island. A glance at the map will show that Bella Coola is remarkably well situated to capture a large share of the trade that will develop from these and other fisheries.

POPULATION.

There are very few people living along the proposed line of railway at present, excepting in the Bella Coola Valley, where there is a population of about 500 Whites and 100 Indians.

From the valley to Mile 280 in the Lower Nechacco River Valley there is

practically no white population and very few Indians, probably 20 of the latter.

From mile 280 there are quite a number of settlers taking up land in the Lower Nechacco valley and north of, and in the vicinity of Ft. George. Including Ft. George, there are probably 1,500 white population. Around Ft. Fraser, Fort St. James, Fort McLeod and vicinity there are probably 20 white men and 200 Indians. No other settlers are found until the Peace River country is reached, where quite a number of homesteaders are living, and some half-breeds. Probably there are not over 3,000 people on the whole line, including Indians, but the territory is capable of supporting a large population when transportation is furnished and it will settle up very quickly thereafter.

TABLE NO. 1 SHOWS ESTIMATED COST OF RAILROAD FROM BELLA COOLA TO SMOKY RIVER, 799 MILES.

To be as follows, including track complete, clearing, grubbing, grading, bridging, telegraph, buildings, etc.

TABLE No. 1.

From Mile.	To Mile.	Dist. Miles.	Cost per mile.	Total cost.
0	30	30	\$25,000	\$ 750,000
30	50	20	30,000	600,000
50	61	11	50,000	550,000
61	76	15	90,000	1,350,000
76	94	18	60,000	1,080,000
94	115	21	22,000	462,000
115	160	45	30,000	1,350,000
160	177	17	30,000	510,000
177	192	15	50,000	750,000
192	215	23	30,000	690,000
215	227	12	25,000	300,000
227	248	21	25,000	525,000
248	269	21	30,000	630,000
269	294	25	40,000	1,000,000
294	314	20	30,000	600,000
314	324	10	35,000	350,000
324	380	56	30,000	1,680,000
Carried Forward		380		\$13,177,000

Brought Forward	From Mile	To Mile	Dist. Miles	Cost per Mile	Total cost
			380		\$13,177,000
	380	396	16	35,000	560,000
	396	406	10	23,000	230,000
	406	425	19	38,000	722,000
	425	432	7	45,000	315,000
	432	434	2	20,000	40,000
	434	446	12	55,000	660,000
	446	465	19	35,000	665,000
	465	485	20	30,000	600,000
	485	520	35	18,000	630,000
	520	539	19	27,000	513,000
	539	558	19	45,000	855,000
	558	582	24	20,000	480,000
	582	594	12	22,000	264,000
	594	618	24	17,000	408,000
	618	637	19	20,000	380,000
	637	694	57	15,000	855,000
	694	697	3	27,000	81,000
	697	701	4	25,000	100,000
	701	718	17	15,000	255,000
	718	728	10	20,000	200,000
	728	737	9	25,000	225,000
	0	737	737	\$30,142	\$22,215,000

Fort George branch, from Salmon River Junction on main line at mile 320, to Fort George, a distance of 62 miles:

From Mile	To Mile	Dist. Miles.	Cost per Mile.	Total cost.
0	32	32	\$32,000	\$ 960,000
32	62	30	37,000	1,110,000
00	62	62	\$33,387	\$2,070,000

Table No. 2 shows total estimated cost of railway from Bella Coola to Smoky River, 737 miles, including branch from Salmon River Junction at

mile 320, to Fort George, 62 miles long, making a total mileage of 799 miles complete, including terminals, sidings, equipment, interest, etc.

TABLE No. 2.

737 miles main line (see Table No. 1) at \$30,142 per mile	\$22,215,000
74 miles sidings at \$10,000 per mile	740,000
8 divisional points at \$100,000 each	800,000
737 miles equipment at \$6,000 per mile	4,422,000
Bella Coola terminal	750,000
	<hr/>
	\$28,927,000
Interest at 4½% for 1½ years, half construction period	1,952,572
	<hr/>
	\$30,879,572
Right of way and incidentals	2,300,000
	<hr/>
737 miles completed road at \$45,021 per mile	\$33,179,572

Fort George Branch—

62 miles (see Table No. 1) at \$34,067 per mile	\$ 2,070,000
6 sidings at \$10,000 each	60,000
Terminals at each end	100,000
Equipment 62 miles at \$6,000 per mile	372,000
	<hr/>
	\$ 2,602,000
Interest at 4½% for 1½ years, half construction period	175,635
	<hr/>
62 miles at \$44,800 per mile	\$ 2,777,635
Incidental expenses and right of way	200,000
	<hr/>
62 miles at \$28,026 per mile	\$ 2,977,635

Summary—

Total cost main line, 737 miles at \$45,021 per mile	\$33,179,572
Fort George branch, 62 miles at \$48,026 per mile	2,977,635
	<hr/>
Total cost, 799 miles at \$45,253 per mile	\$36,157,207

From the above Table No. 2, it will cost \$36,157,207 to build the railroad.

The annual interest charge at $4\frac{1}{2}\%$ will be \$1,627,074, or \$2,038 per mile, not including any discount in selling the bonds.

Figuring that operation will cost two-thirds of the gross income, it will require \$6.114 per mile gross annual income, or \$4,881,222 gross income annually to pay operating expenses and interest on the cost of construction.

PROBABLE TRAFFIC AFTER TEN YEARS' OPERATION.

Table No. 3 below shows estimated acreage tributary to the line within 25-mile haul, on each side of the line.

TABLE No. 3.

From Mile	To Mile	Distance Miles	1st Class Farm Acres	2nd Class Pasture Acres	3rd Class Lands Acres	Total Acres	REMARKS
0	61	61	50,000	10,000	1,190,000	1,250,000	To head of B. C. Valley
61	91	31	5,000	160,000	785,000	950,000	To Summit.
91	183	92	130,000	500,000	1,670,000	2,300,000	To Lake Netalkuz.
183	294	111	600,000	400,000	600,000	1,600,000	To North Stewart Riv.
294	396	102	500,000	650,000	950,000	2,100,000	To Fort McLeod.
396	523	127	40,000	60,000	2,000,000	2,100,000	To edge Peace Riv. Cty.
523	737	214	3,630,000	810,000	560,000	5,000,000	To Peace River Cty.
0	737	737	4,955,000	2,590,000	7,755,000	15,300,000	Total tributary area.
00	62	...	400,000	200,000	200,000	800,000	Fort George branch.

Average outside of 25-mile limit that should be tributary as a stock-raising country.

From Mile	To Mile	Distance Miles	1st Class Farm Acres	2nd Class Pasture Acres	3rd Class Lands Acres	Total Acres	REMARKS
0	61	...	.....	.....	.....	.....	To head of B. C. Valley
61	91	30	.....	200,000	700,000	900,000	To Lake Netalkuz.
91	183	92	.....	600,000	1,800,000	2,400,000	To mouth of Stewart R.
183	294	111	.....	150,000	470,000	620,000	To Fort McLeod.
294	396	102	.....	540,000	1,460,000	2,000,000	To edge Peace Riv. Cty.
396	523	127	.....	30,000	920,000	950,000	To Peace R. Country.
523	737	214	.....	2,000,000	2,000,000	4,000,000	
0	737	737	.....	3,520,000	7,350,000	10,870,000	Total outside 25-m. lim.
...	...	...	4,955,000	6,110,000	10,105,000	26,170,000	Total tributary area.

Table No. 4 shows estimated annual gross and net earnings, assuming that one-third of the agricultural and pasture lands will be utilized 10 years after beginning of operation and that the Company will have to divide with the Canadian Northern, Canadian Pacific, and the Grand Trunk Pacific Railways in the Peace River country, and will get only 50% of this business, also assuming 30 acres of general farming land per carload, 500 acres grazing land per carload of stock, and 50 acres wheat land per carload.

TABLE No. 4.

From Mile	To Mile	1st Class Farm Land Acres	2nd Class or Pasture Land Acres	Av. Haul Miles	No. Cars Farm Produce 1/2 acreage cultvd.	No. Cars Stock 1/2 Acreage Utilized	Total No. Cars	Revenue Per Car	Total Revenue
0	61	50,000	10,000	30	555	5	560	\$ 10.00	\$5,600
61	91	5,000	360,000	80	55	240	295	25.00	7,375
91	183	130,000	1,100,000	140	1,445	735	2,180	45.00	98,100
183	294	600,000	550,000	230	6,665	365	7,030	70.00	492,100
294	396	500,000	1,190,000	340	5,555	795	6,350	100.00	635,000
396	523	40,000	90,000	460	445	60	505	140.00	70,700
523	737	1,815,000	1,405,000	640	18,145	1,405	19,550	160.00	3,128,000
<i>Fort George Branch—</i>									
0	62	300,000	300,000	350	3,330	200	3,530	110.00	388,300

Total outgoing freight revenue . . .	36,195	3,805	40,000	\$4,825,175
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Ingoing freight revenue equal one-third outgoing revenue 1,608,392

Total freight revenue 6,433,567

Passenger revenue equals one-third of total freight revenue 2,144,523

\$8,578,090

Baggage, express and mail, 800 miles, at \$500 per mile 400,000

Total gross earnings, 799 miles, at \$11,237 per mile \$8,978,090

Total operating expenses equals two-thirds of gross earnings 5,985,390

Net earnings, 799 miles, at \$3,745 per mile \$2,992,700

In addition to the above revenue, there will be the coal traffic from the Pine and Peace River country, also the general mining industry, both of

which no doubt will develop very quickly into important traffic producing industries which will help at least to assure the above gross income.

The timber in the Bella Coola Valley, and along the coast line for 100 miles at least both north and south of Bella Coola can be towed by steamer.

The development of fisheries and the pulp industry, with the settlers' supplies, machinery, household goods, mining supplies, etc., will make up the inbound or Eastern tonnage, assumed in the above estimate. This tonnage will develop very quickly.

The above estimate of gross income is assumed after ten years of operation, and it is difficult to estimate the income in the early years of operation, in a new and undeveloped country. But judging from the experiences of other roads in operation both in Canada and the States under similar circumstances, which the writer has had a good chance to observe in the last thirty years of his railway experience, he would estimate that the income for the first four years would be as follows:

Year	Gross Income per Mile	Net Income per Mile	Annual Fixed Charge per Mile	Deficit
First year	\$2,500	\$ 700	\$2,038	\$1,338
Second year	3,500	1,000	2,038	1,038
Third year	4,500	1,500	2,038	538
Fourth year	6,000	2,038	2,038	0

After the third year the road should pay annual operating and interest charges, and be self-supporting. This would leave a deficit of \$2,914 per mile, and for 799 miles a total deficit of \$2,328,286, or, say, \$2,400,000 of a deficit that should be assumed and taken care of in financing the road so that it will be self-supporting.

The advantages that the proposed railway will have will be as follows:

First—A Pacific harbor equal to any of the existing or possible harbors in British Columbia.

Second—It is the shortest practical railway line both from the interior of

British Columbia and the far-famed Peace River country to tide water on the Pacific Coast.

Third—It will compare favorably with existing and proposed railways in British Columbia as to alignment, grades, cost of construction, cheapness of maintenance and operation.

Fourth—The character of the country through which it will run will compare favorably with that of other transeontinental lines in Canada, for the first 100 miles from the coast, and there is probably less waste and unproductive land tributary to it.

Fifth—There will be no especial difficulties in maintaining and operating the road, as there are no bad earth, rock or snow-slides encountered. The snow will not interfere seriously with operation.

GENERAL REMARKS.

The large amount of good agricultural and pasture lands tributary to the line in British Columbia, and especially the Peace River country, which with its millions of acres of wheat and general farming land, is probably the largest body of undeveloped agricultural land on the North American continent, and which will on account of the decreasing quantity and the increasing demand for land by settlers, develop with astonishing rapidity, if properly handled, would alone justify the building of a railroad. In addition to the above, the coal mining industry should develop very quickly into a large traffic producing source. The gold and other mining industries will probably produce a large amount of traffic, while the pulp industry can also be made a profitable source of income. The timber and fish industries, settlers' supplies, machinery, household goods, etc., from the coast will furnish return loads for the otherwise empty cars returning east, and tend to equalize the traffic, and the advantage of the shortest line to tide water, will place the railway in position to dictate rates and force traffic to Bella Coola over its line. The freight rates on wheat to European ports via the Panama Canal will be less than via the present Eastern routes from the Peace River country, as illustrated by the following statement from an eminent authority. Rates are per bushel of wheat:

Via Fort William—

	Summer.	Winter.
Peace River country to Fort William by railway....	18c	18c
Fort William to Europe by ship and railway	13c	20c
Total	31c	38c

Via Bella Coola and Panama Canal—

Peace River country to Bella Coola by railway.....	16c
Bella Coola via Panama Canal by ship	9c
Total	25c

This would be an advantage to the Bella Coola, Panama Canal route of 6c per bushel during the summer, and 13c during the winter months, which should insure the traffic via the proposed line.

GENERAL CONCLUSION.

In conclusion, judging, from the foregoing figures, which I think quite conservative, and my thirty years of observation and close touch with railroads both in Canada and the United States, that have been built and operated through similar new and unpopulated countries (and operated successfully from a financial standpoint) I would say, that, if the proposed railway is properly managed by competent men, who are familiar with Western requirements, as to the rapid development and settlement of new territory, and who are not too restricted in their management from a distance source, it should after three years of operation from the completed construction period, be self-supporting and financially sound; in fact I do not know of a more promising railway proposition.

Yours truly,

G. A. Kyle,

Assoc. Mem. A. Soc. C. E., and Consulting Engineer.

Portland, Ore., November 13th, 1912.

APPENDIX.

Between mile 396 and 553 in the Peace River country, there are three possible routes:

First—Via Pine Pass, the one adopted.

Second—Via the Parsnip and the Peace River Valleys, as far as Hudson Hope Canyon; thence by rising out of the canyon on the north side on a 1% grade, then dropping a light grade and keeping on the north side altogether until Dunvegan, Peace River, is reached; or,

Third—Using second line as far as Hudson Hope Canyon; thence climbing up on a 1% grade on the south side of the river in order to get back from it and avoid the deep canyons near it, arriving at the Summit between the Peace and Pine Rivers near the west end of Moberly Lake, at an elevation of 2,600 feet; thence along the south side of Moberly Lake around the ridge between Moberly and Pine Rivers; thence along the north side of Pine River and crossing it at same point as the Pine Pass line connecting with this line there.

All three of these lines were investigated by Mr. Langloe. The objections to second, or Peace River line, are:

- (a) The line would be 80 miles longer than the Pine Pass line.
- (b) The cost of construction would be greater and the maintenance exceedingly greater on account of the snow and rock slides.
- (c) The necessity of rising above the Hudson Hope Canyon involves the same grades and almost the same elevation as the Pine Pass line; there is, therefore, no advantage in grades.
- (d) No better country is encountered than on the Pine Pass route.

The objections to the third line are:

- (a) It is 93 miles longer than the Pine Pass line.
- (b) The cost of construction and the maintenance more, for the same reasons given on second line down the river.
- (c) The grades and elevation to be overcome would be about the same as on the Pine Pass line.
- (d) No better country would be encountered; therefore,

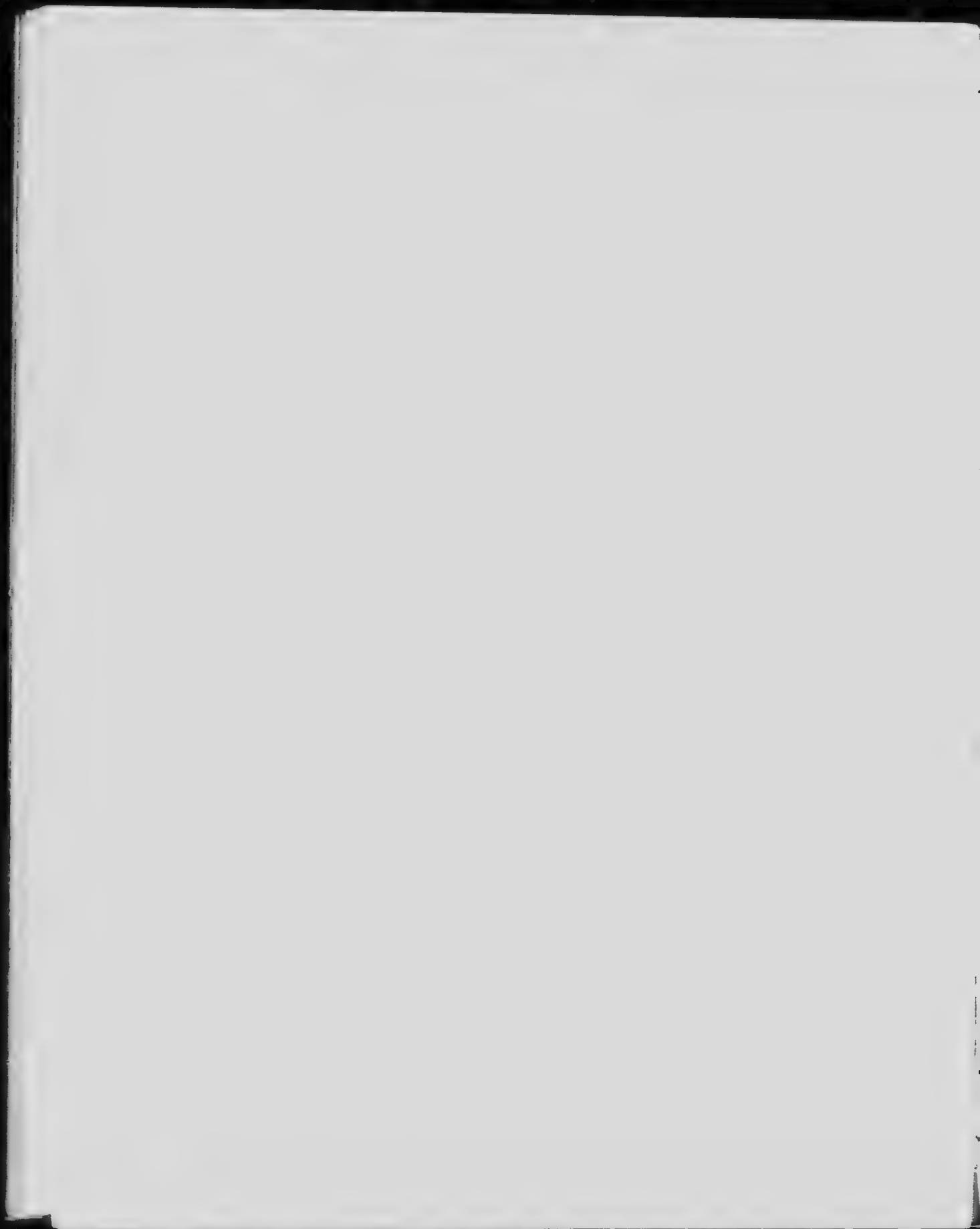
The Pine Pass line was finally adopted for the reason that on a transcon-

tinentai line the shortest and cheapest line to operate is an essential condition; besides the country tributary to the lower Parsnip, Upper Peace and the Finlay Rivers, will probably be taken better care of by a branch line down the Parsnip, with steamers on the Upper Peace River.

G. A. Kyle.

Report by
Mr. C. E. Cartwright





W. D. Verschoyle, Esq.,
Pacific & Hudson Bay Ry. Co.,
Vancouver, B.C.

Dear Sir,—

During the past season the country between Bella Coola and Fort McLeod has been thoroughly covered by reconnaissance surveys, and 52 miles in Bella Coola Valley by preliminary. The Preliminary survey has covered this portion of the Bella Coola Valley thoroughly, so that the final location can be projected, and construction commenced at short notice. The Reconnaissance survey has been carried out in a more thorough manner than usual for this work, over most of the route a system of triangulation being carried through, and levels having been obtained from old C. P. Ry. and Grand Trunk surveys at numerous points, so that the intermediate levels are more accurate than if obtained by Barometer alone; sufficient information has been obtained to construct a contour map of the country traversed on a scale of 2 miles to an inch; on these maps preliminary survey lines can be projected on the Route adopted. In addition to enabling the general route to be decided upon, these maps will save a large expense when actual location is undertaken by saving running miles of preliminary line that would otherwise be necessary. The reconnaissance party was large enough to divide in three parties for side exploration, in this manner every possible route through the country has been examined, and has developed the fact that between Bella Coola and Fort McLeod there are two main routes for consideration. A route to a terminus at Kimsquit instead of Bella Coola has also been examined. A comparison of the several routes determines that the route from Bella Coola to McLeod via Upper and Lower Nechacco Rivers, Stuart River and Upper Salmon, with a branch into Fort George, to be the most economical in first cost, as well as the most direct practicable route from the Peace River Country to tidewater, and by means of the Fort George connection affording also the most direct route to Vancouver.

The following statement of distances will show the comparative shortness of the proposed route from Peace River to tidewater, and also to Vancouver,

compared with routes by which the Canadian Northern and Grand Trunk Pacific Railways can reach the Peace River by building branches:

P. & H. B. Route.

Dunvegan to McLeod.....	304 miles
McLeod to Bella Coola.....	396 "
Total Dunvegan to Bella Coola	700 miles

G. T. P. (by most direct possible connection).

Dunvegan to Yellowhead Pass.....	302 miles
Yellowhead Pass to Fort George.....	235 "
Fort George to Prince Rupert.....	464 "
Total Dunvegan to Prince Rupert	1001 miles

G. T. P. via Edmonton.

Dunvegan to Edmonton.....	300 miles
Edmonton to Yellowhead.....	314 "
Yellowhead to Fort George.....	235 "
Fort George to Prince Rupert.....	464 "
Total Dunvegan to Prince Rupert	1313 miles

C. N. R. via Edmonton.

Dunvegan to Edmonton.....	300 miles
Edmonton to Yellowhead.....	314 "
Yellowhead to Vancouver.....	516 "
Total Dunvegan to Vancouver.....	1130 miles

P. & H. B. Route Dunvegan to Vancouver.

Dunvegan to Bella Coola.....	700 miles
Bella Coola to Vancouver via steamer.....	350 "
Total	1050 miles

P. & H. B. Route via Fort George Connection.

Dunvegan to McLeod.....	304 miles
McLeod to Fort George.....	118 "
Fort George to Vancouver.....	465 "
Total	887 miles

G. T. P. & Pacific Great Eastern.

Dunvegan to Yellowhead.....	302 miles
Yellowhead to Fort George.....	235 "
Fort George to Vancouver.....	465 "
Total	1002 miles

Summary of Routes, Dunvegan to Vancouver.

Dunvegan to Vancouver via P. & H. B. to Fort George.....	887 miles
Dunvegan to Vancouver via Bella Coola.....	1050 "
Dunvegan to Vancouver via G. T. P. Yellowhead to Dun- vegan & Pacific Gt. Eastern.....	1002 "
Dunvegan to Vancouver via Edmonton & C. N. R.....	1130 "
Dunvegan to Vancouver via G. T. P. Edmonton to Fort George.....	1314 "

From foregoing statement it will be seen:—

1. The distance to tidewater at Bella Coola is 301 miles shorter than to Prince Rupert, 302 miles shorter than to Vancouver via G. T. P. & P. G. E. (via Ft. George), and 430 miles shorter than the Canadian Northern Route to Tidewater at Vancouver.

2. The distance by P. & H. B. Route to Bella Coola and Steamer to Vancouver is only 48 miles longer than the shortest possible connection the G. T. P. Ry. could build a branch to near Yellowhead Pass and P. E. Ry. to Vancouver, and 80 miles *shorter* than the Canadian Northern Ry. via Edmonton.

3. The P. & H. B. Route via Fort George to Vancouver is 115 miles

shorter than the G. T. P. via Fort George, and 243 miles shorter than the Canadian Northern Ry.

4. The route to tidewater at Bella Coola is almost equidistant from Edmonton as to Prince Rupert and Vancouver, it will be seen therefore that as a direct line to the seaboard the P. & H. B. Route has a great advantage and can compete on equal terms with the other railways for trade of country as far south as Edmonton.

GRADES.

As the grades obtainable are of extreme importance on a Railway destined for a heavy grain traffic, we are glad to report that a maximum of 26 4-10 ft. per mile is obtainable for westbound traffic at reasonable cost. For eastbound traffic there is one stretch of about 13 miles ascending from the upper Bella Coola Valley to the Plateau country where a grade of 116 feet per mile is advisable, as its use renders practically a saving of distance of 50 miles, and consequently \$2,000,000 in cost of construction; there will also be several stretches of 52.6 per mile grade ascending the Bella Coola Valley adjacent to the 116 feet per mile grade, but these grades are all confined to this portion of line, so that they can be conveniently operated by using assistant engines. Outside this stretch no grades will exceed 26.4 per mile, so that the grades throughout will compare well with the other railways through British Columbia. The Canadian Pacific Railway has at present time maximum grades of 116 feet per mile against both east and westbound traffic, they are spending millions to reduce the grades against westbound traffic to 21.1 per mile, but will still have 116 ft. per mile against eastbound traffic.

The Grand Trunk Pacific will have one grade of 52.8 ft. per mile in one stretch of 20 miles against eastbound traffic, the remainder of the grades being 21.1 ft. per mile in both directions.

The Canadian Northern Ry. will have 21.1 ft. per mile grades in both directions.

The Kettle River Valley Ry. grades are similar to those of the C. P. Ry., with four high summits to cross as a through line over the Columbia & Western Connection.

It will be seen therefore that the P. & H. B. route between Bella Coola and Fort George *compares well* in grades with the other railways, being greatly superior to the Canadian Pacific and Kettle Valley and nearly equal to the

Grand Trunk Pacific Ry., and considering the smaller interest charges owing to moderate cost of construction, the cost of hauling freight will be less than over any of the railways mentioned.

ALIGNMENT.

In regard to alignment a considerable amount of curvature will be required in ascending out of the Bella Coola Valley; after leaving that, it will be light. The cost of construction, it will be observed, is much below that of the other railways crossing British Columbia. The chief reasons for this are that no portion of the route follows any canyons such as the Fraser and Skeena, and the level nature of the Plateau country.

CLIMATE.

The climate is favourable to economical operation and maintenance, no excessive snow occurs on any part of the route, and there will be a total absence of snow slides.

The topography and nature of ground along the route are such that no serious land slides are to be expected.

The climate naturally varies, as in other portions of British Columbia, according to altitude, topography and prevailing winds. The Bella Coola Valley is so sheltered by the mountains on either side that it is free from the excessive rains of the outer coast, and has a rainfall of 44 inches per annum. It further escapes any great cold in winter, and appears to be very similar to that of the Salmon Arm Country on Shuswap Lake. Going inland, the highest elevation on the route is reached about 100 miles from Bella Coola, and the route steadily falls inland. In consequence of this elevation summer frosts probably occur with more or less frequency, and we would consider the country from mile 80 to 180 as only suited to stock raising. From 180 mile to Fort McLeod the climate is suitable to mixed farming or grain growing, with the probability that apples and other hardy fruits can be successfully grown.

NATURAL RESOURCES.

In regard to probable traffic producing resources the country along the route, leaving out of consideration in this portion of the report, the Peace

River country, on a conservative basis I estimate the agricultural lands as follows:—

	1st Class Agricultural and Stock-raising	2nd Class	Waste
Mile 0 to 80	50,000 acres	10,000	2,500,000 acres
" 80 to 180	.....	50,000	3,000,000 "
" 180 to 230	403,000 acres	} 500,000	1,000,000 "
" 230 to 280	516,000 "		770,000 "
" 285 to 396	480,000 " } Land Closer to G. T. P. Not Included		860,000 "
Totals	1,449,000 acres	560,000	8,130,000 acres

In regard to this estimate it should be remarked that much of that placed as 2nd Class Land will probably eventually become 1st Class, and much of that placed as waste will eventually become grazing land, and contain small areas of 1st Class land, the purpose of the estimate being to include the areas likely to become revenue producing within the ten years of opening up of country by railway.

GRAIN FROM PEACE RIVER.

In three years time, at the rate at which settlement is now proceeding, there should be a large acreage under crop. This settlement will undoubtedly increase enormously on the opening up by railway, and will probably be as rapid as on C. P. Ry. branches built into parts of Alberta and Saskatchewan where there is a steady stream of settlers in advance of tracklaying.

It has been stated before a Special Committee of the Senate of Canada that the Peace River Country comprises 60,000,000 acres, of which 75 per cent. is suitable for wheat growing. If only five per cent. of this is under cultivation it would produce at 25 bushels per acre, 50,000,000 bushels, the bulk of which would go to Bella Coola for shipment through the Panama Canal, making 1,250 trains of 40 cars each per annum, and the annual increase would be very rapid. This grain traffic will, however, not be confined to the Peace River, as the P. & H. B. can compete on equal terms at Edmonton with other railways, the distance to seaboard being the same—that is it can secure a share of traffic already existing at Edmonton.

TIMBER.

There is approximately 50,000 acres of first class douglas fir and cedar timber in the tributaries of the Bella Coola Valley. This should produce one

billion feet board measure, which would be hauled an average of 20 miles to mills at Bella Coola and Ocean Falls. After manufacture much of this timber would afford eastbound freight to the railway to Peace River and other interior points. Also on the islands and inlets of the coast there are large limits that can supply mills at Bella Coola and Ocean Falls. There is now at Ocean Falls the largest sawmill on the coast, and another large one at Swanson Bay. Both these places have large pulp mills, as well as the sawmills, and they can reach Bella Coola by barges, being on sheltered waters..

There is a very large traffic in eastbound lumber awaiting completion of railway. This traffic can assume large dimensions without awaiting the settlement of the Interior country, as, has been previously pointed out, the distance by the P. & H. B. route to Edmonton is not greater than by either the Canadian Northern or Grand Trunk Ry., and it follows that the P. & H. B. can secure immediately a share of the lumber business tributary to Edmonton. A great advantage of this traffic is that it will avoid return of empty cars after delivery of wheat at Bella Coola.

SETTLEMENT OF INTERIOR B. C. ALONG ROUTE.

On approach of railway this settlement will be very rapid. During the first year or two the greater traffic will be from coast inwards, bringing in settlers and supplies; afterwards there will be a large export of potatoes, cattle, butter, hogs, poultry and other products of mixed farming.

The land adjacent to the route between Bella Coola and Fort George should in ten years time have a population of 250,000, including several towns from 25,000 population downwards, such as Bella Coola, Junction with P. G. E. Ry., Fort George and other points on the route.

It is probable that industries, such as manufacture of paper, cheese, butter, condensed milk, &c., will be developed.

FRUIT.

The Bella Coola Valley should develop into a fruit growing district, the climate being very similar to the Salmon Arm Country on Shuswap Lake, and the market should become an excellent one. It would have advantage of several hundred miles of rail haul over any rival district for supplying Peace River Country.

FISH.

The fisheries of British Columbia are capable of great development, the

only fishery fully developed being Salmon canning. The greatest fishing grounds for Cod, Halibut and other fish are in the vicinity of Queen Charlotte Islands. A glance at the map will show that Bella Coola is remarkably well situated to capture a large share of the trade that will develop from these fisheries.

IRON, COPPER, COAL, ETC.

Coal is known to outcrop at several places in the Interior, but as far as now known is all lignite, which would only be used locally. Further explorations may however demonstrate the existence of bituminous coal, as a large area belongs geologically to the Cretaceous Period

Large deposits of Magnetite exist adjacent to Bella Coola Valley. Hematite ore has been reported from several localities, and I am informed on good authority that a very large deposit has lately been located. This means the possibility of a great traffic in ore to Bella Coola, Hematite ore being greatly in demand on the Coast, and also makes Bella Coola a probable location for iron and steel works. From reports I get, there are 30,000,000 tons of Hematite ore, and an unlimited supply of Magnetite available.

A large deposit of good grade copper ore has been developed to some extent on the Saloompt River 7 miles from Haggensburg on the proposed railway. The construction of railway will probably enable the property to ship, and numerous other prospects are reported. A large development is to be expected in mining in the vicinity of Bella Coola Valley, as favourable geological conditions occur.

In the Interior the geological conditions along the route do not appear favourable to other minerals than coal and iron, but there are hills adjacent that may prove on more thorough prospecting to carry other minerals.

GENERAL.

The traffic available on completion of railway will be greater in through traffic than is generally the case of a new railway; the local traffic as well as the through will rapidly increase, and in ten years after completion it will probably be rapidly approaching the full capacity of single track railway.

The through traffic to be expected from Peace River Country is not by any means confined to agricultural products. Geological survey reports point strongly to the presence of oil fields of enormous extent, as well as on the Athabasca River of asphalt, and further to the north extensive salt deposits.

In estimating the probable immediate traffic to be secured by the P. & H. B. Ry. and the growth of the traffic afterwards, it is advisable to call attention to a very remarkable condition, and that is that this, the most inaccessible grain growing district in America becomes, by the construction of the Panama Canal and this railway, the most favoured region for cheap shipment to Europe.

The grain grower in Peace River will have only 700 miles rail to tide-water, and the balance all by sea, with only the transfer at Bella Coola. Compared with a longer rail haul to Fort William and Duluth and transfers at three points by the Great Lakes route.

The rate therefore for grain from Peace River will probably be lower to Liverpool than from Manitoba, with proportionate decrease of rates from Saskatchewan.

The effect of these conditions on the settlement of the country, combined with the fact that the Peace River and the Northern Interior of British Columbia is the last large field for emigration in America, will likely cause all records in rapid settlement to be surpassed.

ESTIMATE OF PROBABLE TRAFFIC IN FIRST YEAR AFTER COMPLETION.

	Gross Earnings
Grain from Peace River }	
“ “ Edmonton } 5000 cars (probably more)	\$ 650,000
Timber, etc., from Coast (Eastbound) 6000 cars	300,000
Settlers & Effects, 10,000 at \$100 each.	1,000,000
Miscellaneous products from Nechaco Valley	150,000
Miscellaneous, Fish, Coal, Minerals.	50,000
Total	<u>\$2,150,000</u>
which equals \$2,687.00 per mile.	

The item from grain is put at a very low figure for first year, with intention of allowing for delays in arranging diversion of trade to a new route. In two or three years this traffic should increase several times in volume, and in ten years after completion of the railway will in all probability, with the increase of other traffic bring gross earnings to not less than \$10,000 per mile.

The above estimate of gross earnings per mile in first year after completion is believed to be very conservative, and will probably reach not less than \$3,000

per mile. Returns of railways built under similar conditions confirm this result, and, as previously pointed out, there are special reasons for extremely rapid growth.

In addition to the items figured for immediate fairly large returns, there are possibilities of other items developing in time for immediate results, such as coal and iron.

The tourist traffic on this route will never compare with the C. P. Ry., as the country is not of a mountainous character excepting that adjoining Bella Coola Valley, where some resorts may develop in future.

THE HARBOUR OF BELLA COOLA.

The harbour of Bella Coola is situated at the head of North Bentinck Arm, and is approached from the Pacific by Fitz Hugh Sound and Burke Channel, the distance being approximately 80 miles to open sea.

It is 350 miles from Vancouver via channels travelled by the steamer route to Prince Rupert, Skagway, &c.

For all vessels taking the regular route to Japan and China, the distance from Bella Coola is 350 miles less than from Vancouver.

For vessels to Panama Canal and Southern Ports the distance is 170 miles greater than to Vancouver, which would not be sufficient to affect freight rates from distant points. Fitz Hugh Sound forms part of the regular steamship route up the coast; it is about five miles in width, is well lighted, and possesses no difficulties to navigation.

Burke Channel and North Bentinck Arm are deep channels averaging 1 1-2 to 2 miles in width, free from islands and shoals. Although there is at present an absence of lights on these channels, the steamers navigate them on the darkest nights. The Marine Department would undoubtedly establish lights on Bella Coola becoming a more important port. The approach to Bella Coola from the sea is remarkably free from dangers to navigation. The Captain of the Union S.S. Venture stated that he always could reckon on a rest when he entered it.

The harbour proper is 1 1-4 miles wide. Extending across the whole east side of harbour are mud flats, which form an excellent site for the economical construction of wharves; on the south side moderately shoal water extends for some two miles, rendering extension of wharves feasible when required. On the north side precipitous rock bluffs extend for two miles. The

water close to these bluffs is as deep as in centre of harbour, and land for trackage can only be obtained by removing large quantities of rock.

The average depth of the harbour is 53 fathoms; while too deep for convenient anchorage can easily be overcome by the establishment of moorings for any vessels that may require them. The harbour is well sheltered from any sea that would affect ordinary vessels, the greatest sweep not exceeding five miles.

A map has been prepared to accompany this report showing a series of wharves on the mud flats, railway yards and approaches. This shows a development of seven and a half miles of wharfage suitable for the largest ships. This wharfage is more than three times that at present in the harbour of Vancouver, and equals that of Montreal, the largest port in Canada. An excellent site for large railway yards exists on the land immediately east of the flats, now an Indian Reserve. This land is flat with a gentle slope towards the harbour, and the grading needed would be very light.

A more ideal place for construction of wharves could hardly occur. The entrance of considerable bodies of fresh water by the Bella Coola and Nelectseonnay Rivers will prevent action of teredo on piling, the material in the slips can be cheaply excavated by dredging, and filled in behind retaining walls. Plenty of rock when required can be obtained from the adjacent sides of the harbour, and cedar timber from the valley, or by water. Wharves can be built for about one-third of what the cost would be in Vancouver harbour.

The portion of the valley adjoining the harbour forms an excellent site for a city.

Excellent water can be obtained, and several locations occur where water power can be developed.

No ice forms in the harbour in winter, and the rainfall is not excessive, being less than Vancouver, and very much less than Prince Rupert.

The climate is very good, the mountains sheltering the valley from the rains of the outer coast and also from the north winds, and is equal to that found much further south.

ESTIMATE, BELLA COOLA TO McLEOD.

Mileage.	Cost per Mile.	Distance.	Total Cost.
0-30	\$ 25,000	30	\$ 750,000
30-50	30,000	20	600,000
50-61	50,000	11	550,000
61-76	90,000	15	1,350,000
76-94	60,000	18	1,080,000
94-115	22,000	21	462,000
115-160	30,000	45	1,350,000
160-177	30,000	17	510,000
177-192	50,000	15	750,000
192-215	30,000	23	690,000
215-227	25,000	12	300,000
227-248	25,000	21	525,000
248-269	30,000	21	630,000
269-294	40,000	25	1,000,000
294-314	30,000	20	600,000
314-324	35,000	10	350,000
324-380	30,000	56	1,680,000
380-396	35,000	16	560,000
-----	-----	-----	-----
396 miles			\$13,737,000

62 Miles Branch to Fort George--

32 Miles at \$30,000.....	\$ 960,000
30 Miles at \$37,000.....	1,110,000
	----- 2,070,000

	\$15,807,000

**TOTAL ESTIMATED COST, BELLA COOLA TO SMOKY RIVER AND
BRANCH TO FORT GEORGE, 799 MILES.**

Bella Coola to McLeod as per foregoing statement	\$15,807,000
McLeod to Smoky River, 341 miles.....	8,478,000
Sidings and Terminals at Eight Division Points	800,000
Bella Coola Terminal	750,000
Eighty Sidings, one mile each, at \$10,000	800,000
Terminals on Branch.....	100,000
Equipment, 799 miles at \$6,000.....	4,794,000
Interest one and a half years.....	2,128,207
Right of Way and Contingencies.....	2,500,000
	\$36,157,207

799 Miles—\$45,253 per mile.

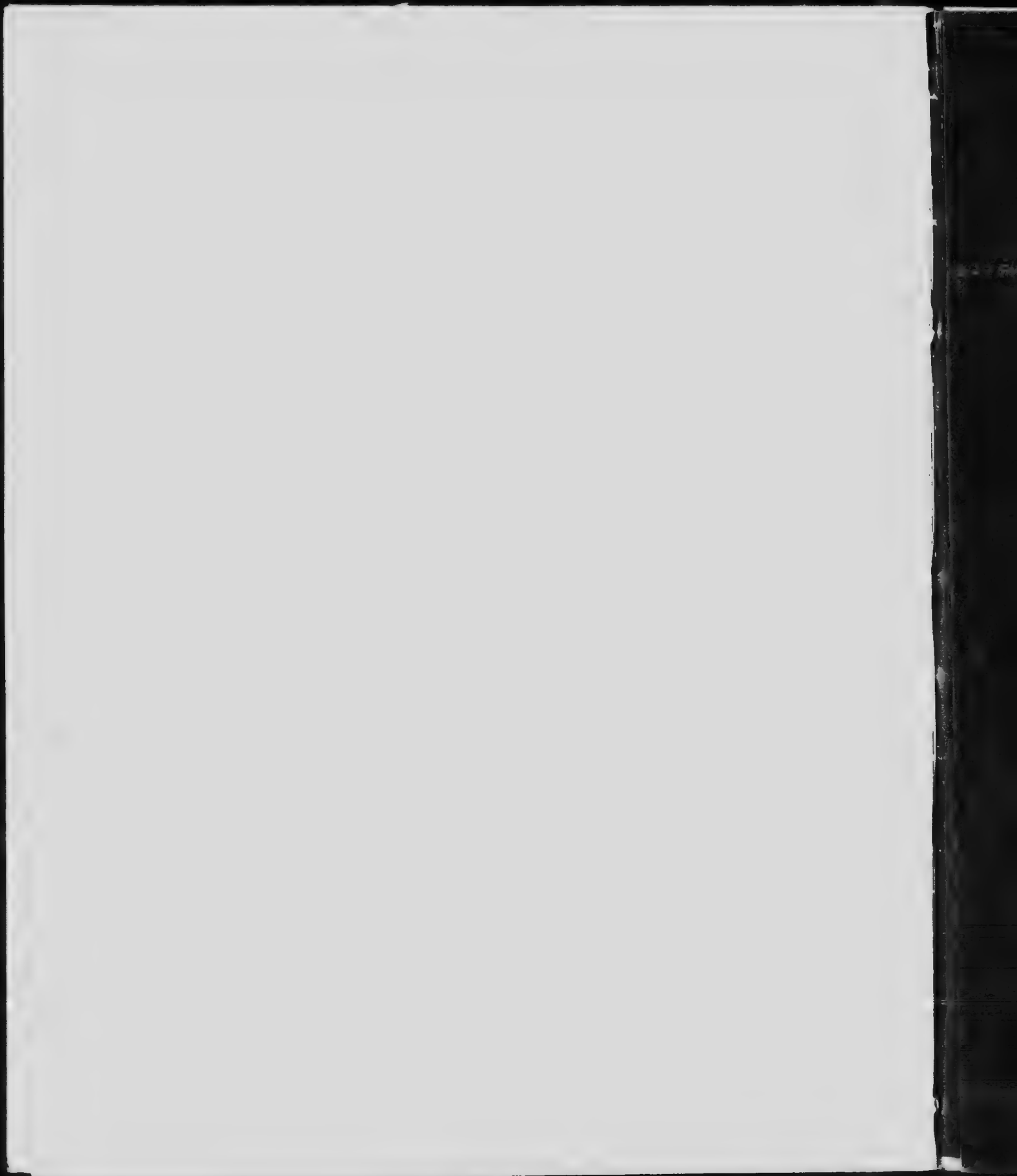
C. E. CARTWRIGHT,
M. Can. Soc. C. E.,
Consulting Engineer.

Vancouver, B. C., November 13th, 1912.



Report by
Mr. E. C. Harris





PLATEAU

QUANT RIVER

PLATEAU

1970

1980

1970

1980

PROFILE **PACIFIC AND HUDSON BAY R.R.** **Bella Coola to Smoky River**

Horizontal Scale: *1 inch = 1 mile*
 Vertical Scale: *400 ft = 1 inch*

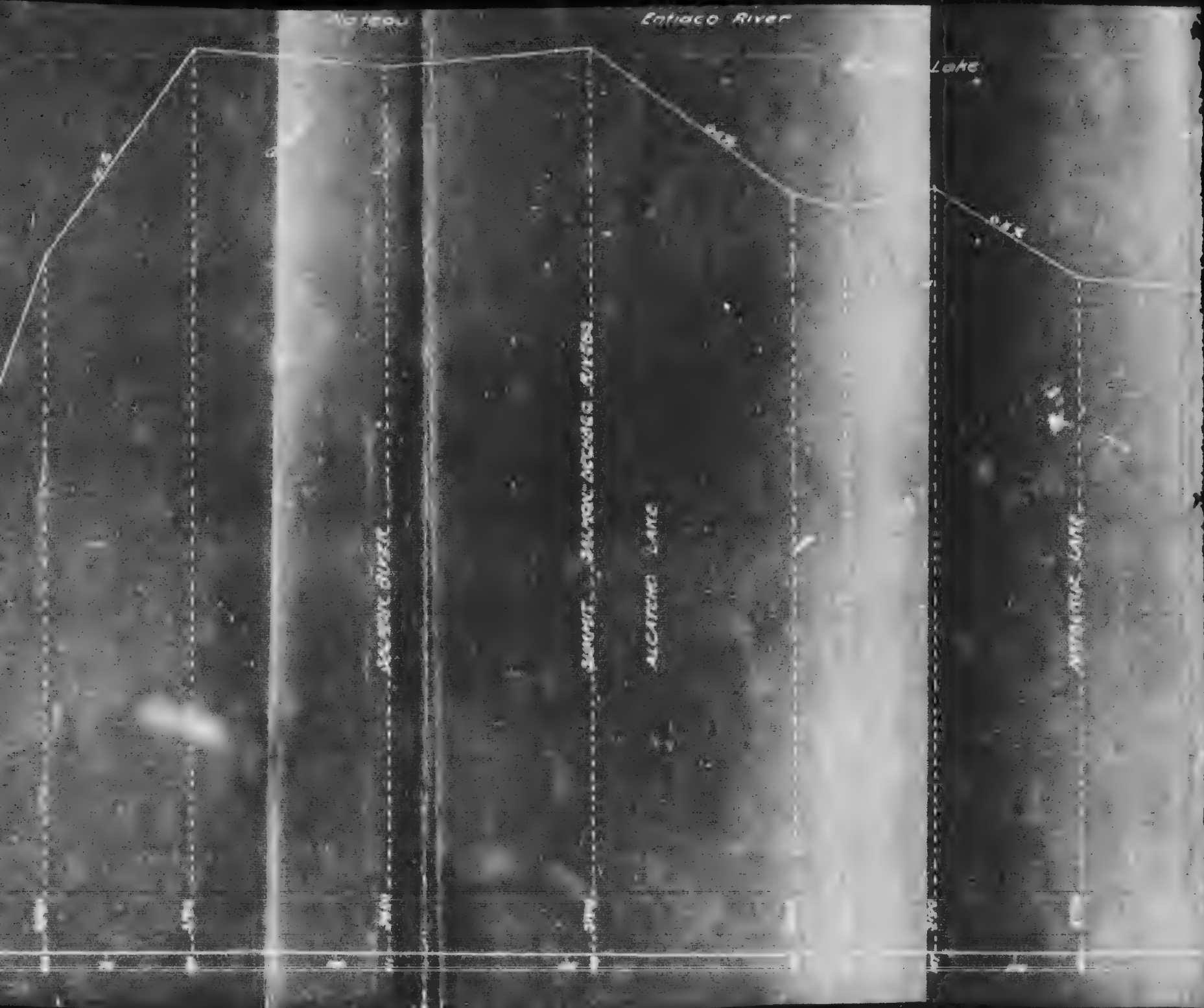
Prepared by S.C.
 Dec. 13 1912

C. H. Smith
 Consulting Eng.



See also page 1110





Upper Nechaco River
Many Greek Settlements

Sinkler River

Swamp River

STANLEY CREEK

St. George

St. George

St. George

Branch

NECHACO RIVER CROSSING

UNIT FT GEORGE BRANCH

JUNCT. FT. GEORGE BRANCH

SALMON RIVER

8000 - 8000 - 8000

CARE LAKE

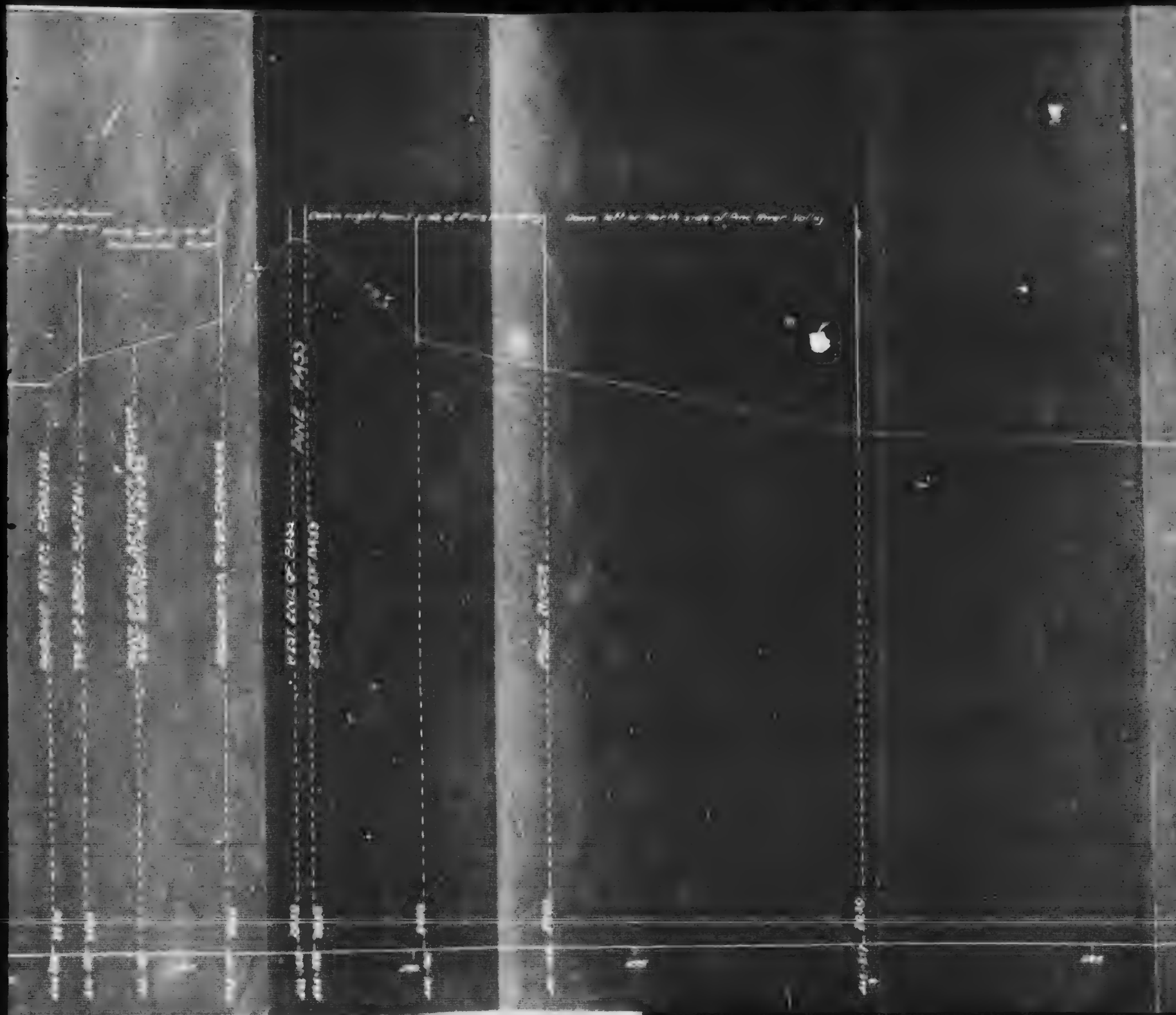
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From left bank of River to
right bank of River

From left bank of River to
right bank of River

From left bank of
River to right bank of
River

From left bank of River to
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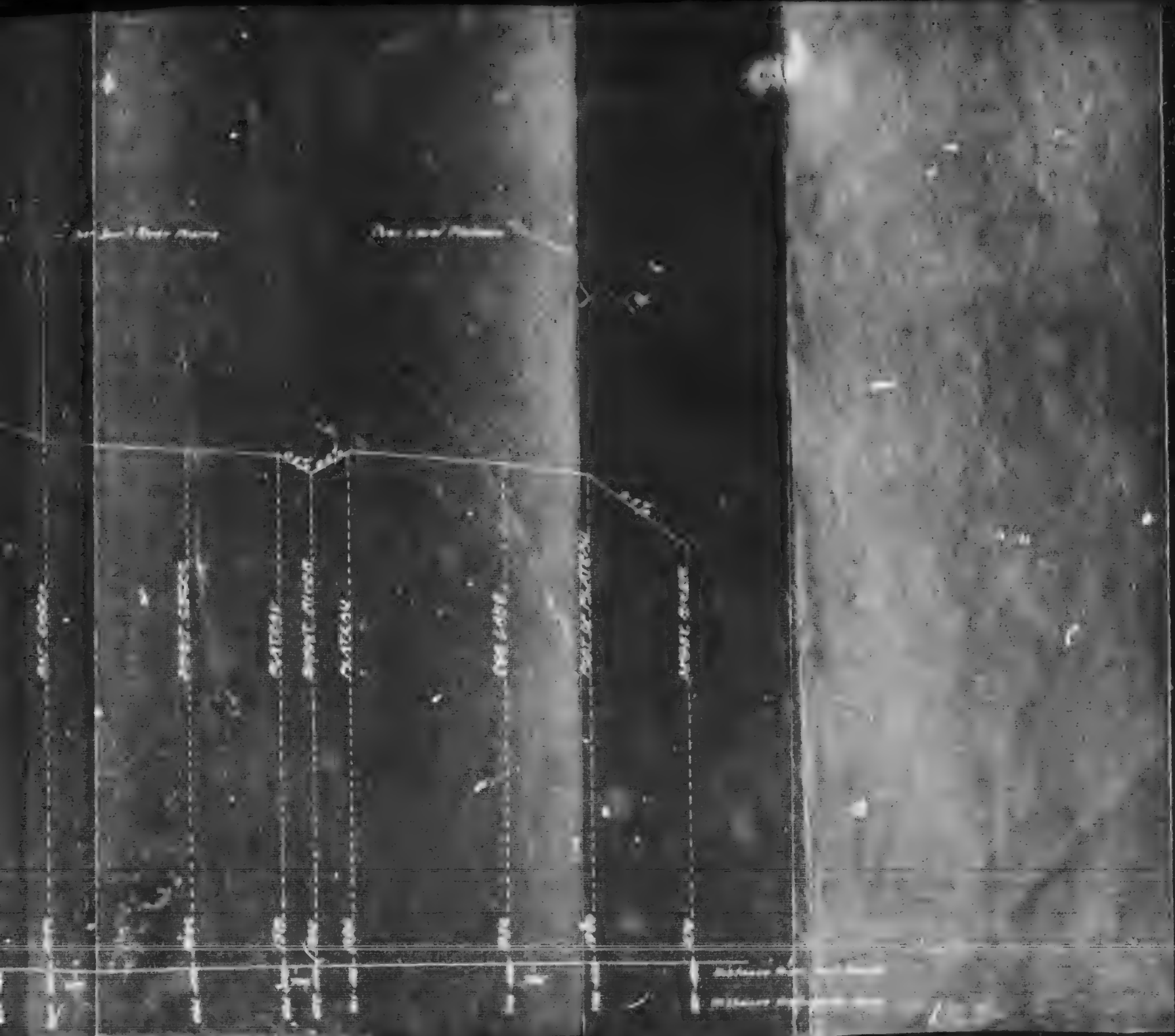
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Carleton
Profrs

W. D. Verschoye, Esq.,
Pacific & Hudson Bay Ry. Co.,
Vancouver, B.C.

Dear Sir,—

I have carefully examined and checked the reports made by Messrs. George A. Kyle and C. E. Cartwright under date of November 13th, 1912, in relation to the proposed line of Railroad from Bella Coola to the Peace River country, approximately 800 miles.

I have gone over a large portion of the territory personally, have also given thought and study to the project for several months, with a view to determining its prospects and earning capacity after it has been fully constructed and properly equipped to economically handle the business.

In a technical sense the topography of the country allows of a line being located, particularly through the Cascade Range and the Rocky Mountains, that will result in the construction of a road combining a low interest charge with a minimum cost of maintenance and operation and will compare in an extremely favorable manner with any of the other transcontinental lines. The mountain sections will be particularly remarkable for their entire freedom from snow sheds and snowslides, expensive bridges, high viaducts, high embankments, or objectionable excavations which will undoubtedly tend to give economical operating results.

The general location of the entire line from a commercial and traffic standpoint is unique and highly favorable as it passes through a distance of about 700 miles capable of the highest agricultural development, and I believe in time a great deal of the doubtful lands will be brought into use by dry-farming and the raising of alfalfa for the feeding of cattle, sheep and hogs.

The shortening of the distance from the Peace River country to tidewater as compared with other transcontinental lines is an important point and one that will be a leading feature in the control of export and import business from this district to the Orient and to European ports via the Panama Canal.

In the opinion of the writer, one of the most important features is the location of the western terminus of the line at the port of Bella Coola which is one of the best harbors on the Pacific Coast between San Francisco to the south, approximately 1,000 miles, and Prince Rupert to the north, approximately 200 miles.

The vast wheat area of the Peace River country alone will, in my judg-

ment, justify the building of the Pacific & Hudson Bay Railway, particularly where such a line has the short rail haul to tidewater which will give the farmer, on the opening of the Panama Canal, the benefit of the cheapest possible transportation and therefore the highest price for his products in the European markets, also the benefit of a possible market in the Orient.

It is the judgment of the writer that we can build and equip the entire line from Bella Coola to the Peace River country, approximately 800 miles, for \$45,000.00 per mile (allowing \$6,000.00 per mile for equipment) with practically a ruling grade of 1% east-bound, which will include twelve miles of 2.2% pusher grade beginning about 55 miles east of Bella Coola. From the Bella Coola summit east-bound to Smoky River, Alberta, will be 5/10 of 1%, which includes a seven-mile 1% pusher grade through the Pine Pass; west-bound we have a ruling grade of 5/10 of 1% the entire distance, which includes a twelve-mile 1% pusher grade through the Pine Pass.

Considering the indefiniteness of some of the factors that enter into a computation of the future earning power of the Railway, it is manifestly difficult to determine accurately the gross and net earnings per mile of road. The volume and nature of its traffic, its prospects for future settlement and development, the physical characteristics of the country, the grades and distances, the freight rates, the management of the line directed from British Columbia by practical and experienced Railroad men familiar with Western conditions; all have a bearing upon the question. Summing it all up, however, I am of the opinion, and would venture the prediction, that within a year after the line is completed to the Peace River country, the gross earnings will be about \$3,000.00 per mile, and the net about \$900.00 per mile, and should increase at the rate of about 20% each year thereafter.

CONCLUSION.

My conclusion based upon an analysis in checking the reports made by Messrs Kyle and Cartwright, my personal examination of the territory, the study which I have given it in the light of my experience in railroad construction and operation, and my general knowledge of the railway situation in Canada and the United States, is that their reports are more than conservative, and I have no hesitation in endorsing the proposition, as a whole, as commercially sound.

Respectfully Submitted,

E. C. HARRIS.

November 22nd, 1912.

